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THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

SUPPLEMENT 159

RESULTS OF COOPERATIVE CORN, FLAX, AND SOYBEAN SEED TREATMENT TESTS IN 1944

October 15, 1945

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

RESULTS OF COOPERATIVE CORN, FLAX, AND SOYBEAN SEED TREATMENT TESTS IN 1944

Plant Disease Reporter
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COOPERATIVE CORN SEED TREATMENT TRIALS FOR 1944 IN THE CENTRAL AND NORTHERN STATES REGION

George Semeniuk[1]

A single hybrid, US 13, obtained in Iowa and represented by a 100 lb. seed-lot produced in 1943, was used. The seed was divided into 5 equal parts, with 4 of them receiving treatment with one of Semesan Jr. (1% ethyl mercury phosphate) at 1 1/2 oz. per bushel; Barbak-C (8% mercuric phenyl cyanamide) at 1 1/2 oz.; Spergon (98% tetrachloro-para-benzoquinone) at 2 oz.; and Arasan (50% tetramethyl thiuramdisulfide) at 1 oz. per bushel; while the fifth remained untreated as a control. On the second day after treatment the seeds were packeted in coin evelopes in lots of 100 seeds and distributed to the cooperators. Plantings in the field were made in rod-row plots arranged in complete randomized blocks, replicated 6 times. The plots were spaced 1 foot apart and received the seeds from a single packet. As many as 5 repeat plantings were made at different dates beginning in late April. The locations and cooperating individuals were:

St. Paul, Minnesota . .	M. B. Moore	Ames, Iowa	G. Semeniuk
Columbia, Missouri . .	C. M. Tucker	Madison, Wisconsin .	P. E. Hoppe
Urbana, Illinois . . .	B. Koehler	Lafayette, Indiana .	A. J. Ullstrup

Field Emergence Results

The weather conditions in the corn belt throughout much of the normal corn planting period from late April to late May, 1944, were abnormally wet and cold and thus delayed planting in some locations for as much as a month beyond the usual time. The mean emergence results, the days taken for emergence, the mean temperature during the emergence period, as well as the soil moisture conditions at the different planting dates for the different States, are presented in Table 1. Soil type and pH for the different locations are indicated in a footnote of the Table.

Significant benefits in emergence from seed treatment in Minnesota were obtained in plantings made on May 19, May 24, and June 10, but not on May 31; in Iowa on April 29, May 6 and 16, but not on May 30; in Missouri on May 19 and June 30, but not on May 26 and June 23; in Wisconsin in the planting made April 29, in Illinois on April 21 and May 4 and 12, but not on May 25 and June 2; and in Indiana on planting dates April 20 and 27, May 8 and 20, but not on May 30. The significant treatment effect obtained on the May 25 planting in Illinois was due to the reduction in emergence obtained from Arasan treatment. Nonsignificant reductions were obtained in Illinois on the May 12 and June 2 plantings and in Missouri on the May 26 planting. Arasan treatment on the June 30 planting in Missouri was significantly better than the nontreated but inferior to the other treatments. Weather conditions in Missouri before and subsequent to the June 23 and 30 plantings were too dry for uniform emergence with the result that many seeds did not germinate until after the July 25 rainfall.

In general, Arasan proved superior to Spergon, Semesan Jr., and Barbak-C at such planting dates as required one week or longer for emergence, but significance (at the 5% level) was attained only when nearly 2 weeks were required for emergence (Tables 2 and 3). Spergon proved equal to Semesan

[1]Chairman, Corn Seed Treatment Subcommittee, Central and Northern States Region

Table 1. Summary of field emergence results obtained in corn seed treatment tests in six States, 1944

Location[a]	Planting date	Mean air temperature[b] °F	Days to emergence	Soil moisture[e]	Seed treatment: Non-treated	Semesan Jr.	Barbak C	Spergon	Arasan	Treatment °F[g]	Difference for significance 5%
Minnesota	May 17	62.4	9	Wet	37.7	83.8	76.1	91.3	89.3	123.45**	5.85
	May 24	68.8	5	Moderate	84.0	93.3	93.3	93.8	94.5	12.66**	3.64
	May 31	65.5	7	Wet	88.5	92.5	92.3	91.3	93.3	1.56	—
	June 10	69.1	7	Wet	64.0	87.5	84.3	89.6	89.5	20.96**	6.98
Iowa	April 29	32.5	15	Wet	32.5	63.8	34.0	68.2	92.2	114.63**	6.95
	May 6	57.2	10	Wet	57.2	83.3	72.3	83.7	85.3	48.96**	5.11
	May 16	67.3	5	Wet	67.3	76.3	78.3	76.8	87.7	7.19**	8.01
	May 30	89.7	4	Moderate	89.7	93.3	93.0	90.8	92.8	1.53	—
Missouri	May 19	76.5[c]		Moderate	70.5	86.7	85.7	76.3	77.7	10.29**	6.24
	May 26	76.8		Moderate	81.0	92.8	91.0	87.2	72.7	5.16**	10.66
	June 23	84.0		Dry[f]	38.5	48.1	46.7	52.5	52.8	2.25	—
	June 30	80.5		Dry[f]	41.7	65.8	64.1	74.1	57.3	13.71**	4.65
Wisconsin	April 29	55.1		Moderate	65.3	84.7	73.7	88.3	88.5	23.85**	6.17
Illinois	April 21	53.1[d]	17	Wet	56.3	81.5	73.2	87.8	89.0	31.84**	6.99
	May 4	55.0	9	Wet	52.7	81.7	74.2	82.7	87.3	58.99**	5.26
	May 12	69.0	4	Wet	88.2	90.5	94.0	88.0	86.2	3.99**	4.44
	May 25	78.4	4	Wet	87.0	90.7	89.5	90.2	71.2	20.59**	5.36
	June 2	79.1	4	Moderate	87.0	88.0	90.8	91.5	85.0	3.46*	4.75
Indiana	April 20	58.4[d]	14	Wet	75.0	88.0	84.7	92.2	93.8	17.87**	5.21
	April 27	58.4	14	Wet	80.3	94.0	89.2	91.3	92.2	15.70**	3.98
	May 8	68.0	8	Wet	69.3	87.0	84.0	90.0	87.5	45.29**	3.61
	May 20	77.2	5	Wet	91.3	96.8	96.5	96.8	97.0	5.29**	3.33
	May 30	83.7	5	Wet	90.7	94.0	93.5	93.7	93.7	1.61	—

For footnotes see opposite page

Table 2. Number of times each treatment was better than any other treatment

Location	Planting date	Based on differences at 5% level of significance: Non-treated	Semesan Jr.	Barbak C	Spergon	Arasan	Based on significant (5% level) and non-significant differences: Non-treated	Semesan Jr.	Barbak C	Spergon	Arasan
Minn.	May 17	0	2	1	3	3	0	2	1	4	3
	May 24	0	1	1	1	1	0	1	1	3	4
	May 31	0	0	0	0	0	0	3	2	1	4
	June 10	0	1	1	1	1	0	2	1	4	3
Iowa	April 29	0	2	0	2	4	0	3	1	3	4
	May 6	0	2	1	2	2	0	2	1	3	4
	May 16	0	1	1	1	4	0	1	3	2	4
	May 30	0	0	0	0	0	0	4	3	1	2
Mo.	May 19	0	3	3	0	1	0	4	3	1	2
	May 26	0	2	1	1	0	1	4	3	2	0
	June 23	0	0	0	0	0	0	2	1	3	4
	June 30	0	2	2	4	1	0	3	2	4	1
Wis.	April 29	0	2	1	2	2	0	3	1	2	4
Ill.	April 21	0	2	1	2	3	0	2	1	3	4
	May 4	0	2	1	2	3	0	2	1	3	4
	May 12	0	0	4	0	0	2	3	4	0	1
	May 25	1	1	1	1	0	1	4	2	3	0
	June 2	0	0	1	1	0	1	2	3	4	0
Ind.	April 20	0	1	1	2	3	0	2	1	3	4
	April 27	0	2	1	1	1	0	4	1	2	3
	May 8	0	1	1	2	1	0	2	1	4	3
	May 20	0	1	1	1	1	0	2	1	2	4
	May 30	0	0	0	0	0	0	4	1	2	2
Total		1	28	24	29	31	5	61	39	59	64

Footnotes to Table 1

[a]Soil type and pH: Missouri--Putnam silt loan, pH 5.5; Indiana--Warsaw silt loam, pH 5.6; Iowa--Webster silty clay loam, pH 6.2; Illinois--Flanagan silt loam, pH 5.6

[b]Mean of minimum and maximum daily temperatures over the period from planting to emergence

[c]Mean of minimum and maximum daily temperatures for 4 days following planting

[d]Soil temperature at seed level

[e]Condition of soil following planting to emergence

[f]Soil was very dry with germination being erratic and retarded until after July 5 rain

[g]Required "F" for 1% level = 4.43; 5% level = 2.87

Table 3. Days to emergence in relation to the number of times that each treatment was better than any other treatment

Location	Planting date	Based on differences at the 5% level of significance: N.T.	Seme: san Jr.	Bar-: bak C	Sper-: gon	Ara-: san	Location	Planting date	Based on significant (5% level) and non-significant differences: N.T.	Seme: san Jr.	Bar-: bak C	Sper-: gon	Ara-: san
					Emergence period of 14 or more days								
Iowa	Apr.15	0	2	0	2	4	Iowa	Apr.15	0	3	1	3	4
Ill.	Apr.17	0	2	1	2	3	Ill.	Apr.17	0	2	1	3	4
Ind.	Apr.20	0	1	1	2	3	Ind.	Apr.20	0	2	1	3	4
Ind.	Apr.27	0	2	1	1	1	Ind.	Apr.27	0	4	1	2	3
	Total	0	7	3	7	11		Total	0	11	4	11	15
					Emergence period of 7 to 13 days								
Minn.	Jun.10	0	1	1	1	1	Minn.	May 17	0	2	1	4	3
Iowa	May 6	0	2	1	2	2	Minn.	May 31	0	3	2	1	4
Wis.	Apr.29	0	2	1	2	2	Minn.	Jun.30	0	2	1	4	3
Ill.	May 4	0	2	1	2	3	Iowa	May 6	0	2	1	3	4
Ind.	May 8	0	1	1	2	1	Wis.	Apr.29	0	3	1	2	4
							Ill.	May 4	0	2	1	3	4
							Ind.	May 8	0	2	1	4	3
	Total	0	8	5	9	9		Total	0	16	8	21	25
					Emergence period of less than 7 days								
Minn.	May 24	0	1	1	1	1	Minn.	May 24	0	1	1	3	4
Iowa	May 16	0	1	1	1	4	Iowa	May 16	0	1	3	2	4
Mo.	May 19	0	3	3	0	1	Iowa	May 30	0	4	3	1	2
Mo.	May 26	0	2	1	1	0	Mo.	May 19	0	4	3	1	2
Mo.	Jun.30	0	2	2	4	1	Mo.	May 26	1	4	3	2	0
Ill.	May 12	0	0	4	0	0	Mo.	Jun.23	0	2	1	3	4
Ill.	May 25	1	1	1	1	0	Mo.	Jun.30	0	3	2	4	1
Ill.	Jun.2	0	0	1	1	0	Ill.	May 12	2	3	4	0	1
Ind.	May 20	0	1	1	1	1	Ill.	May 25	1	4	2	3	0
							Ill.	Jun. 2	1	2	3	4	0
							Ind.	May 20	0	2	1	2	4
							Ind.	May 30	0	4	1	2	2
	Total	1	11	15	10	8		Total	5	34	27	27	24

Jr., while Barbak-C was the least effective under these same conditions. Where emergence occurred within less than 1 week, Semesan Jr. proved generally superior to the other fungicides, although Barbak-C appeared to be slightly better than either Semesan Jr. or Spergon on the basis of significant effects. Arasan, under these conditions, appeared the least effective fungicide.

Greenhouse Emergence Results

Greenhouse emergence tests in Iowa, using field-soil freshly obtained from an area closely adjacent to the field plot, revealed marked benefits in emergence from seed treatment under conditions of initially prolonged cold temperatures of 47° F (8.3° C), in contrast to continuous greenhouse temperatures of 25 to 30° C. Non-significant differences amongst the fungicides were obtained under the latter continuous warm temperature conditions using steamed or nonsteamed soil (Table 4). Significant benefits from treatment were obtained only in nonsteamed soil. The order of the fungicides from the greatest to the least effective, when seeds were subjected to an initial cold, with moist soil conditions, was Arasan, Semesan Jr., Spergon, and Barbak C, with the last named being the least effective by far.

Table 4. Greenhouse emergence results.

Soil treatment	Temperature	Seed treatment: Non-treated	Semesan Jr.	Barbak D	Spergon	Arasan	Treatment "F"	Diff. for sign. 5% level
Steamed	25-30° C	18.8[a]	19.4	19.0	19.3	19.8	1.90[b]	---
Nonsteamed	25-30° C	18.4	19.5	19.2	19.1	19.6	3.05*[b]	0.77
Nonsteamed	8.3° C for 10 days, then 25-30° C	0.5	16.4	5.7	15.1	17.7	9.44**[c]	1.26

[a]Mean emergence from 20 seeds planted in each of 10 replications in as many flats of soil

[b]Required "F" at 5% level = 2.63

[c]Required "F" at 1% level = 6.01, 5% level = 3.55. Calculated only for treatments of Semesan Jr., Spergon, and Arasan

The marked benefits in emergence from seed treatment obtained in the greenhouse and field under cold, wet soil conditions are attributable in large measure to the seed lot used. Examination of this seed lot revealed the seed coat to be damaged over the embryo in 100% of the kernels, while crown damage was prevalent on 25% of the kernels. The former more serious injury provides an entrance to the embryo for the seed-rotting Pythiums of the debaryanum type that flourish in early spring under cold, moist soil conditions, while the latter type of injury is less injurious to stand. Planting hypochlorite disinfected samples of the untreated seed lot on to potato dextrose agar medium in petri dishes revealed 93.7% of the kernels to be viable; 6.8% yielded Diplodia zeae, 4.9% Fusarium moniliforme, 17.5% Chaetomium sp., Penicillium spp., and Mucor spp., leaving 70.7% of the

Table 5. Percentage of weak plants in field plantings.

Location	Planting date	Seed treatment: Non-treated	Semesan Jr.	Barbak C	Spergon	Arasan	Treatment "F"	Diff. for sign. at 5% level
Minn.	May 17	6.0	2.8	4.5	3.1	3.1	26.45**	1.4
	May 24	17.3	2.4	4.5	3.6	4.4	25.21**	3.6
	May 31	3.8	1.5	1.6	2.2	1.5	3.23**	1.4
	June 10	4.0	1.8	3.2	2.8	1.3	1.77	---
Mo.	June 6	22.9	4.4	3.3	6.1	4.9	26.90**	4.7
	June 13	19.0	2.1	3.5	3.8	2.2	3.98*	3.4
Wis.	Apr. 29	7.7	2.5	3.4	3.0	1.3	4.61**	3.4
Ill.	Apr. 21	15.7	5.1	9.6	6.3	4.6	8.57**	4.6
	May 4	23.9	11.4	13.3	10.2	9.2	5.38**	7.6
	May 12	32.5	5.2	6.2	7.4	6.8	26.62**	5.7
	May 25	25.2	4.0	4.8	7.2	4.0	33.41**	2.1
	June 2	46.0	8.7	10.5	17.2	6.3	184.29**	1.7

Required "F" at 1% level = 4.43, 5% level = 2.87

Table 6. Percentage of plants in the Iowa test below the mode height class for the non-treated.

Planting date	Mode height class	Seed treatment: Non-Tr.	Semesan Jr.	Barbak C	Spergon	Arasan	Treatment "F"	Diff. for sign. at 5% level
	cms							
Apr. 29	10.0-12.4	36.7	44.1	29.5	18.4	10.7	17.70**	9.7
May 6	10.0-12.4	49.7	40.5	35.8	34.5	29.4	5.20*	11.6
May 16	12.5-14.9	51.9	45.9	35.1	43.8	26.9	4.91*	18.6
May 30	12.5-14.9	44.6	17.4	10.0	14.7	11.4	5.84*	19.3

Required "F" at 1% level = 7.01, 5% level = 3.34

Table 7. Mean height of plants (cms) from nontreated and treated seed planted in the greenhouse.

Soil treatment	Seed treatment: Non-treated	Semesan Jr.	Barbak C	Spergon	Arasan	Treatment "F"[a]	Diff. for signif. at 5% level
Steamed	9.6[b]	17.7	16.4	17.7	16.7	4.37**	4.6
Nonsteamed	12.9	14.4	13.4	14.0	14.2	9.48**	1.6

[a]Required "F" at 1% level = 3.89, 5% level = 2.63

[b]Mean height of plants from 20 seeds planted in each of 10 replications in as many flats of soil. Plants 3 weeks old.

Table 8. Mesocotyl and primary root necrosis of corn plants in the Iowa field test.

Planting date	Examination date	Percentage of plants infected: Seed treatment: Non-treat.	Seme-san Jr.	Barbak C	Spergon	Arasan	Diff. for sign. at 5% level	Disease severity: Seed treatment: Non-treat.	Seme-san Jr.	Barbak C	Spergon	Arasan	Diff. for sign. at 5% level
Mesocotyl necrosis -- first examination													
Apr. 29	Jun. 2	83.7	77.2	75.9	76.0	66.6	---	50.7	39.4	45.6	47.3	49.8	---
May 6	Jun. 2	80.0	61.9	86.7	80.9	70.6	13.8	42.7	29.5	47.4	49.7	33.0	11.3
May 16	Jun. 13	75.8	45.8	73.7	77.3	57.3	12.4	39.3	22.3	35.1	39.6	28.4	---
May 30	Jun. 22	69.3	44.0	58.0	47.3	48.6	9.6	33.5	18.4	24.6	20.8	18.8	6.5
Mesocotyl necrosis -- second examination													
Apr. 29	Jun. 21	100.0	100.0	100.0	100.0	100.0	---	98.2	88.4	96.2	97.3	91.9	6.0
May 6	Jun. 21	100.0	100.0	100.0	100.0	100.0	---	95.5	89.6	97.7	95.5	92.8	---
May 16	Jun. 24	98.6	96.0	100.0	96.0	96.0	---	74.1	62.6	75.5	71.5	70.1	---
May 30	Jul. 6	94.6	94.6	97.3	90.6	97.3	---	64.8	65.3	66.6	56.8	69.7	---
Primary root necrosis -- first examination													
Apr. 29	Jun. 2	92.3	89.0	90.8	90.0	91.5	---	44.0	40.3	44.8	44.1	40.9	---
May 6	Jun. 2	58.3	49.1	72.2	71.0	57.3	---	28.8	19.2	33.3	30.2	26.2	---
May 16	Jun. 13	79.2	44.4	59.7	78.0	71.1	---	27.5	17.6	22.9	33.3	29.8	---
May 30	Jun. 22	23.3	16.6	27.3	25.3	21.3	---	9.2	5.7	9.5	10.8	7.7	---
Primary root necrosis -- second examination													
Apr. 29	Jun. 21	100.0	100.0	100.0	100.0	100.0	---	98.2	96.1	98.1	96.4	94.1	---
May 6	Jun. 21	100.0	100.0	100.0	100.0	100.0	---	91.9	89.7	96.8	91.9	92.0	---
May 16	Jun. 24	100.0	100.0	100.0	100.0	100.0	---	88.0	89.2	89.7	89.7	92.4	---
May 30	Jul. 6	93.3	100.0	98.7	98.7	98.7	---	76.4	78.6	68.4	75.5	76.8	---

kernels free of organisms. While the present seed lot failed to meet the requirement of nearly disease-free seed essentially typical of the present day hybrid seed-corn production and considered necessary to a study of the role of soil-borne organisms in reducing stands and vigor of plants, the presence of the seed-borne organisms was considered of only minor importance because the fungus flora on the roots and mesocotyl proved essentially different from that usually found on the seeds. The seed coat injuries over the embryo, sustained during processing and common in the hybrid seed-corn industry (Tatum, L. A. and M. S. Zuber, Germination of maize under adverse conditions; Jour. Amer. Soc. Agron. 35: 48-59, 1943), favored accentuated conditions for seed treatment benefits.

Vigor of Seedlings

Two types of measurements were made on vigor of seedlings: (1) the percentage of weak or stunted plants at a time when at least 3/4 of the plants were in the 3-leaf stage, and (2) height of individual plants as measured from the crown to the tip of the longest leaf. Readings of the first type were made in Minnesota, Wisconsin, Illinois, and Missouri (Table 5). Marked benefits from seed treatment in vigor of seedlings in the field were obtained on the May 24 planting in Minnesota, on all plantings made in Illinois, and on the June 6 and June 13 plantings made in Missouri. Significant but smaller benefits also were obtained on the May 17 and 31 plantings in Minnesota and the April 29 planting in Wisconsin. No consistent advantage was evident of one fungicide over another. Measurements of plant heights in the field in Iowa when approximately 1 foot high revealed nonsignificant differences amongst the treatments in mean plant heights at all planting dates although the percentage of plants below the mode was for the nontreated generally greatest, and least with Arasan treatment (Table 6). Plants grown in the greenhouse on steamed and nonsteamed soil under continuous temperatures of 25 to 30° C for 3 weeks showed significantly greater height due to treatment but without any difference amongst the dusts (Table 7).

Mesocotyl and Primary Root Necrosis

Mesocotyl and primary root necrosis of young corn plants developed in the present field tests were determined in Iowa. Two examination periods, using 3 replications from each date-planting, were made when the plants were approximately 1 and 2 feet high, respectively. The plants were dug with a digging-fork, hand-freed of most of the soil and washed in a forced stream of water. Fifty plants were taken at random from each plot and were scored individually according to the following:

Class	Mesocotyl	Primary root
0	No necrosis	No necrosis
1	One-third necrotic	One or two roots with short necrotic areas at or near the seed or removed some distance away
2	Two-thirds necrotic	All roots with short necrotic areas at or near the seed or removed some distance away
3	Completely necrotic	All roots necrotic at or near the seed with some or all roots showing long necrotic areas

and the data for each plot summarized as to mesocotyl or primary root necrosis using the formula:

$$\frac{\text{Sum of ratings given individual plants} \times 100}{\text{Number of plants examined} \times 3}$$

Mesocotyl and primary root necrosis was more prevalent and more severe on plants examined at the second period when approximately 2 feet high than at the first period when only 1 foot high (Table 8). Greater necrosis was shown by plants from date-plantings made in late April and early May than in late May. Regular curves can be obtained by plotting the prevalence and severity of necrosis against days from planting to examination but this relationship does not hold when a subtraction is made of the period required for seedling emergence. By doing the latter the intervals from emergence to examination are nearly equalized at approximately 18 days for the first examination and 35 days for the last, and therefore the lower prevalence of necrosis obtained on later plantings presumably is attributable to comparative lateness of the season with consequent lower activity of pathogenic organisms. The present result may not be divergent from that of 1943 (PDR Suppl. 145, pp. 63-75, 1944) since it may represent only the top portion of those curves.

Benefits from seed treatment on necrosis reduction were more evident in the earlier than in the later period of plant development. The effects of seed treatment were thus operative in the early period of plant development, perhaps before the effective fungicidal material had become dissipated in the soil. Semesan Jr. generally proved most effective in reducing the extent and severity of mesocotyl infection, with Arasan being next. Barbak C and Spergon offered some protection only in the May 30 planting. Primary root necrosis was not reduced significantly by any of the fungicides although less necrosis generally was obtained with Semesan Jr. treatment than by any of the other fungicides.

Examination of 3-week-old plants developed from similar seed in flats in the greenhouse under steamed and nonsteamed soil conditions at continuous temperatures of 25 to 30° C revealed marked decreases in disease on the mesocotyl and primary root in the presence of seed treatment materials, with greater reduction in steamed than in nonsteamed soil (Table 9). Semesan Jr. proved the most effective under both soil conditions while the

Table 9. Mesocotyl and primary root necrosis of 3-weeks-old corn plants in the Iowa greenhouse test

Soil treatment	Percentage of plants infected: Seed treatment: Non-treated	Semesan Jr.	Barbak C	Spergon	Aragan	Diff. for sign. 5% level	Disease severity: Seed treatment: Non-treated	Semesan Jr.	Barbak C	Spergon	Aragan	Diff. for sign. 5% level
Mesocotyl												
Steamed	85.7	18.7	38.0	42.9	57.3	13.9	66.2	11.8	20.3	22.2	35.3	11.8
Nonsteamed	54.0	14.1	38.0	26.5	20.3	15.3	24.7	5.7	15.4	14.6	8.5	11.2
Primary root												
Steamed	68.5	13.8	25.0	28.1	31.0	10.8	53.9	6.1	10.9	12.7	18.4	5.6
Nonsteamed	37.0	10.1	31.4	26.8	27.3	14.4	15.8	4.5	14.1	12.6	10.8	7.0

other fungicides were similar in effectiveness.

Fungi Associated with the Necrotic Tissues

Platings of necrotic tissues onto a carrot-extract agar medium were made soon after the plants were dug in the field for examination of the roots and mesocotyls. The tissues were washed overnight in running tap water followed by several dips in as many changes of sterilized, distilled water. Excess water was removed from the tissues with sterilized filter paper in petri dishes before the tissues were planted on the surface of the agar medium. In most cases the necrotic tissues were taken from regions closely adjacent to healthy tissues. Thus mesocotyl tissues for the most part were taken next to the crown while primary root tissues were obtained some distance away from the seed. Tissues from secondary roots were obtained adjacent to and some distance from the crown, while those from the crown were taken in the region from where the secondary roots emerged.

The same general types of fungi were obtained (Table 10) as in 1943. Necrotic primary roots yielded predominantly the same Helminthosporium sp., Fusarium moniliforme, and Phoma sp. as in the previous year; the latter organism then being referred to as one forming chlamydospores. The Helminthosporium sp. was considered similar to H. pedicellatum Henry, being (on carrot-extract medium) a little broader and longer (26-30 μ x 69-75 μ), with fewer septations on the average (5 septa), being somewhat darker in color, and having a pronounced acute apex on the mature spores. The Phoma sp. on initial isolation from carrot-extract agar medium produced intercalary chlamydospores (12-17 μ) and dark brown pycnidia (60-85 μ) with biguttulate, ovcid, hyaline spores (6.0-7.0 μ x 3.5 μ). The Helminthosporium sp. proved only mildly pathogenic to inbred line Hy corn seedlings under steamed-soil conditions, while the Phoma sp. was not pathogenic. The latter organism was also isolated in the late spring and early summer from a

Table 10. Relative frequency of fungi isolated from necrotic tissues of young corn plants in the Iowa field test.

Date planted	Date examined	Number examined: Plants	Number examined: Necrotic areas	Fungi isolated: Gibberella sp.	Helminthosporium sp.	Fusarium moniliforme	Phoma sp.	Curvularia spp.	Trichoderma sp.	Alternaria sp.	Pythium spp.	Diplodia zeae
Mesocotyl -- first examination												
Apr.29	June 2	10	10			10	4	3	5	2	2	
May 6	June 2	8	8	2	1	4	6		2			
May 16	June 13	8	8			8	3		5		1	
May 30	June 22	13				13	2		10			
Mesocotyl -- second examination												
Apr.29	June 21)	13	13		2	13	8		4		2	1
May 6	June 21)											
May 16	June 24	13	13		1	11	7	1	5			
May 30	July 6	6	6		1	4	4		5			
Primary root -- first examination												
Apr.29	June 2	13	18	1	8	15	16	2	2	1	2	
May 6	June 2	9	14	1	9	8	12	1	1	1	3	
May 16	June 13	9	9		9	7	7		1	2	2	
May 30	June 22	15	16		9	13	11	1	9		1	2
Primary root -- second examination												
Apr.29	June 21)	9	24		17	14	15	1			12	
May 6	June 21)											
May 16	June 23	10	16		11	13	13	1	2		1	
May 30	July 6	12	21		17	10	20	1			1	

leaf spot (carrying embedded Phoma pycnidia on corn plants with symptoms common to those described for Phoma zeicola Ell. & Ev., Bull. Torr. Club 27: 573, 1900; Phyllosticta zeae Stout, Mycologia 22: 271, 1930; and P. sorghina Sacc., Mycologia 33: 655, 1941; Phytopath. 11: 253, 513, 1921). In preliminary greenhouse tests the Phoma sp. isolated from the roots and leaves induced a leaf-spot disease of corn plants when the young plants were sprayed with an aqueous conidial suspension. It was somewhat surprising that so few isolates of Pythium were obtained, since the medium was considered favorable for their appearance. Several species of Curvularia were obtained for the first time from corn seedlings.

The same predominating organisms were obtained from the primary roots of plants 2 feet high as from those only 1 foot high. In addition, the necrotic areas on secondary roots of the older plants carried the same fungi as those on the primary roots.

Fusarium moniliforme was the predominating fungus isolated from necrotic mesocotyls at the early and later periods of examination. Phoma sp. and Trichoderma sp. were next in abundance, while Helminthosporium sp., Pythium sp., Curvularia sp., Gibberella sp., Alternaria sp., and Diplodia zeae were isolated occasionally.

The crown region of plants approximately 2 feet high generally was discolored a light brown, and yielded Fusarium moniliforme, bacteria, and Phoma sp. in nearly all cases. Trichoderma sp. was less frequent.

Summary

Benefits in emergence from seed treatment of US hybrid 13 at 6 locations under test in 1944 were obtained from plantings made in late April and through most of May. The seed showed seed-coat injury over the embryo in 100% of the kernels, and carried seed-borne fungi on 30% of the kernels. In general, Arasan proved superior or equal to Spergon and Semesan Jr. under cold, wet soil conditions requiring 1 to 2 weeks for emergence, while Barbak C under these conditions was the least effective. Semesan Jr. and Barbak C proved slightly superior to Spergon and Arasan under conditions requiring less than 1 week for seedling emergence.

Seedling vigor generally was greater from seed treatment. Differences amongst seed treatment materials were not noticeable, except perhaps in Iowa where Arasan appeared the most effective and Semesan Jr. the least.

Mesocotyl necrosis was reduced most by Semesan Jr. and to a lower extent by Arasan. Spergon and Barbak C generally were ineffective except at the May 30 planting. Primary root necrosis generally was unaffected by seed treatment, except to a slight extent by Semesan Jr.

CORN SEED TREATMENT SUBCOMMITTE
CENTRAL AND NORTHERN STATES REGION
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COOPERATIVE FLAX SEED TREATMENT TESTS IN 1944[1]

F. J. Greaney

It is recognized generally that good stands are essential in the successful production of flax. To obtain information concerning the effect on stand (plant emergence) of treating sound and damaged (mechanically-injured) seed of Royal flax with different fungicidal seed treatment materials, a cooperative test was conducted at several stations in the United States and Canada in 1944. The materials and rates of application used are given in Table 1. Plans and seed materials for the tests were prepared at the Winnipeg Laboratory. The experiment was planted at the following cooperating stations: St. Paul, Minnesota (M. B. Moore); Ames, Iowa (C. S. Reddy); Fargo, North Dakota (T. E. Brentzel): Madison, Wisconsin (H. L. Shands); Geneva, New York (W. F. Crosier); Brookings, South Dakota (W. F. Buchholtz); Bozeman, Montana (R. H. Bamberg); Pullman, Washington (C. S. Holton); and at Winnipeg, Morden, and Brandon in Manitoba (F. J. Greaney). The results of these tests are summarized in Tables 1, 2, and 3.

Table 1. Effect of treating sound and mechanically-injured seed of Royal flax with different seed treatments on seedling emergence (stand). Results of greenhouse tests in beds of non-sterile soil. (Data are means of 2 trials).

Fungicide	Oz. per bu.	Percentage emergence[a] (seedling stand)	
		Sound seed[b]	Injured seed[c]
New Improved Ceresan	1/4	81	22
	1/2	87	42
	1	80	59
	1 1/2	86	60
	2	84	71
	3	92	63
Semesan Jr.	2 1/2	82	29
Spergon	3	86	29
	1 1/2	79	30
Arasan	3	80	53
	1 1/2	86	40
None (check)	---	76	17
Necessary difference, 5% level	---	6.6	10.1

[a] Seed of Royal flax from crop grown at Winnipeg in 1942

[b] Seed from flax plants threshed by means of an ordinary clothes wringer. Percentage of damaged kernels = 0.0

[c] Seed from flax plants threshed by a machine equipped with a steel cylinder. Percentage of kernels fractured = 31.0

[1] Under the auspices of the Committee for Coordination in Cereal and Vegetable Seed Treatment Research, of the American Phytopathological Society

Table 2. Effect of treating sound seed of Royal flax with different fungicides on seedling emergence (stand). (Data are means of 4 plots)

Percentage seedling emergence (A - seed)

Fungicide	Oz. per bu.	Winnipeg, Man.	Morden, Man.	Brandon, Man.	Geneva, N. Y.	Madison, Wis.	Ames, Iowa	St. Paul, Minn.	Brookings, S. D.	Fargo, N. D.	Bozeman, Mont.	Pullman, Wash.	Average (11 stations)
New Improved Ceresan	1/4	65	70	68	54	55	58	61	54	62	76	51	61.3
	1/2	63	72	69	60	51	62	59	45	67	78	56	62.0
	1	65	70	69	56	51	56	61	47	62	74	48	60.0
	1 1/2	66	65	67	54	57	59	62	55	61	73	47	60.5
	2	69	71	70	61	49	60	56	58	68	71	45	61.6
	3	72	68	67	56	50	54	61	56	65	74	47	60.9
Semesan Jr.	2 1/2	64	71	65	58	52	56	58	51	64	76	48	60.0
Spergon	3	69	68	65	53	58	60	55	50	60	70	52	60.0
	1 1/2	64	66	60	52	53	58	54	45	66	71	53	58.4
Arasan	3	65	66	65	58	56	56	56	50	60	75	58	60.0
	1 1/2	70	69	65	58	56	58	58	46	66	73	50	60.8
None (check)	---	61	70	68	52	49	60	61	50	65	73	51	60.0
Necessary difference, 5% level	---	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	4.6	(a)	(a)

(a) Differences between fungicides insignificant statistically

Table 3. Effect of treating mechanically-injured seed of Royal flax with different fungicides on seedling emergence (stand). (Data are means of 4 plots).

Percentage seedling emergence (B - seed)

Fungicide	Oz. per bu.	Winnipeg, Man.	Morden, Man.	Brandon, Man.	Geneva, N. Y.	Madison, Wis.	Ames, Iowa	St. Paul, Minn.	Brookings, S. D.	Fargo, N. D.	Bozeman, Mont.	Pullman, Wash.	Average (11 stations)
New Improved Ceresan	1/4	26	38	33	23	12	25	20	20	34	53	30	28.5
	1/2	25	36	36	19	15	33	21	25	38	49	27	29.4
	1	34	44	45	23	19	31	27	27	39	57	27	33.9
	1 1/2	35	34	46	23	22	29	28	29	38	50	34	33.4
	2	44	50	49	20	22	31	27	33	39	54	31	36.4
	3	44	42	48	22	25	31	34	27	40	44	31	35.3
Semesan Jr.	2 1/2	24	34	44	21	18	33	18	26	39	59	24	30.9
Spergon	3	32	36	27	18	19	30	30	20	33	56	31	30.2
	1 1/2	23	37	28	23	24	30	23	22	32	56	27	29.5
Arasan	3	30	39	39	19	17	31	25	21	34	58	39	32.0
	1 1/2	24	37	36	19	16	26	24	21	33	58	28	29.3
None (check)	---	20	30	24	23	9	20	18	17	34	49	32	25.1
Necessary difference, 5% level	---	10.2	9.6	9.4	(a)	5.5	(a)	6.0	7.5	(a)	7.5	(a)	3.93

(a) Differences between fungicides insignificant statistically

Table 4. Effects of treating sound and mechanically-injured seed of Royal flax with different fungicides on emergence and yield at Winnipeg and Morden, Manitoba, in 1944

Fungicide	Oz. per bu.	Percentage emergence (seedling stand)			Yield (bu. per acre)		
		Winnipeg	Morden	Average (2 stations)	Winnipeg	Morden	Average (2 stations)
Sound seed (A)							
New Improved Ceresan	1/4	65	70	67.5	27.4	18.9	22.2
	1/2	63	72	67.5	26.8	15.2	21.0
	1	65	70	67.5	28.2	16.6	22.4
	1 1/2	66	65	65.5	2818	16.2	22.5
	2	69	71	70.0	30.1	16.1	23.1
	3	72	68	70.0	27.5	17.2	22.4
Semesan Jr.	2 1/2	64	71	67.5	27.1	16.1	21.6
Spergon	3	69	68	68.5	26.9	17.1	22.0
	1 1/2	64	66	65.0	26.0	15.2	20.6
Arasan	3	65	66	65.5	27.8	18.0	22.9
	1 1/2	70	69	69.5	25.9	18.0	22.0
None (check)	---	61	70	65.5	26.6	16.4	21.5
Injured seed (B)							
New Improved Ceresan	1/4	26	38	32.0	27.9	16.6	22.2
	1/2	25	36	30.5	26.9	17.2	22.0
	1	34	44	39.0	28.0	18.4	23.2
	1 1/2	35	34	34.5	27.1	16.9	22.0
	2	44	50	47.0	27.0	18.9	23.0
	3	44	42	43.0	26.5	15.9	21.2
Semesan Jr.	2 1/2	24	34	29.0	26.0	17.0	21.5
Spergon	3	32	36	34.0	26.4	16.6	22.5
	1 1/2	23	37	30.0	26.2	16.0	21.2
Arasan	3	30	39	34.5	27.5	18.4	23.0
	1 1/2	24	37	30.5	25.6	16.7	21.2
None (check)	---	20	30	25.0	26.2	16.2	21.2
Necessary difference, 5% level		10.7	8.6	4.4	(a)	(a)	(a)
Mean of sound seed		66.1	68.8	67.4	27.4	16.8	22.1
Mean of injured seed		30.1	38.1	34.1	26.8	17.1	22.0
Necessary difference, 5% level		4.7	2.4	3.3	(a)	(a)	(a)

(a) Differences between fungicides and kinds of seed insignificant statistically

In addition to the above-mentioned stand tests, separate experiments were made at Winnipeg and Morden, Manitoba, to determine the effect of different seed treatments on the yield from sound and damaged seed of Royal flax. The results of the yield tests are presented in Table 4.

The results of greenhouse trials with each kind of treated and untreated sound and injured flax seed used in the field tests of 1944 are given in Table 1. These data indicated that the sound and injured seed lots of Royal flax would be suitable for field studies.

The seedling stand results for the different stations are given in Tables 2 and 3. As might be expected, no beneficial effects were observed when sound, high quality flax seed was treated with New Improved Ceresan, Arasan, Spergon, and Semesan Jr. (Table 2). On the other hand, at a number of stations, treatment of mechanically-injured flax seed with New Improved Ceresan increased seedling stand as much as 100%. Rates of 1 oz. and more per bushel were in general more effective than the 1/4 and 1/2 oz. rates, in a number of instances significantly so, but there were no marked differences between the 1, 1 1/2, 2, and 3 oz. rates. Arasan and Spergon applied at the rate of 1 1/2 oz. per bu. were about as effective as New Improved Ceresan applied at the 1/2 oz. rate, but were not equal to it at the higher rates. The results in Table 3 indicate that the damaging effects of mechanical injury to flax seed are partly, but only partly, overcome by treatment, and emphasize the importance of reducing mechanical injury in seed flax.

The most striking results of the 1944 field tests were in respect to yield. At Winnipeg and Morden, Manitoba, in 1944, plots of injured flax seed produced approximately one-half the number of plants as did the plots of sound seed (Table 4). However, no differences in yield between sound and injured seed plots were observed. In other words, under Manitoba conditions in 1944, 50 flax plants yield as much as did 100 plants. It should be mentioned, however, that, in these tests, weed competition was eliminated by cultivation. It is entirely possible that under farm practice, where weeds are an important factor, the heavier stands from non-injured and from treated, injured seed would outyield the lighter stands. A statistical study of the data of the 1944 stand and yield tests with flax emphasized the need of careful planning and adequate replication in field tests with this crop.

DOMINION LABORATORY OF PLANT PATHOLOGY, WINNIPEG, MANITOBA

RESULTS OF THE UNIFORM SOYBEAN SEED TREATMENT TESTS IN 1944[1]

W. B. Allington, G. C. Kent, I. W. Tervet, and Benjamin Koehler[2]

The uniform soybean seed treatment test in 1944 was expanded to include several Southern and Eastern States as well as most of those in the North Central area which cooperated in 1943. This experiment was conducted at 9 locations in 1943 (PDR Suppl. 145, pp. 76-79), and at 18 locations in 1944 (Table 1).

Table 1. Cooperators, locations, and general results of the soybean seed treatment tests in 1944.

Location	Cooperator	Planting date	Variety	Significant effect of chemical seed treatment	
				On stand	On yield
		Northern Test	Manchu 606		
Brookings, S.Dak.	W. F. Buchholtz	June 7		None	None
Madison, Wis.	J. G. Dickson			None	None
St. Paul, Minn.	I. W. Tervet			Increase	None
		Central Test	Lincoln		
Lincoln, Nebr.	J. E. Livingston	May 30		None	None
Ames, Iowa	G. C. Kent			Increase	None
Columbia, Mo.	C. M. Tucker	May 19		None	None
Urbana, Ill.	B. Koehler	May 19		None	None
Lafayette, Ind.	R. M. Caldwell	June 8		None	None
East Lansing, Mich.	J. H. Muncie	June 28		None	(a)
Columbus, Ohio	L. C. Saboe			None	None
Beltsville, Md.	H. W. Johnson			Increase	None
Newark, Del.	J. W. Heuberger	May 19		(a)	(a)
		Southern Test	Ogden		
Stuttgart, Ark.	E. M. Cralley	May 13		None	None
Stillwater, Okla.	K. S. Chester	April 29		None	None
Stoneville, Miss.	P. R. Henson	May 8		Increase	None
Auburn, Ala.	C. Wilson	May 13		None	None
Experiment, Ga.	J. L. Weimer	June 22		None	None
Raleigh, N. Car.	S. G. Lehman	May 2		None	None

(a) No data taken because of weather damage, etc.

[1]These seed treatment tests were conducted under the auspices of the Subcommittee on Soybeans of the general Seed Treatment Committee of the American Phytopathological Society.

[2]Associate Pathologist, U.S. Regional Soybean Laboratory; Assistant Professor of Botany, Iowa Agricultural Experiment Station; Instructor in Plant Pathology, Minnesota Agricultural Experiment Station; and Chief in Crop Pathology, Illinois Agricultural Experiment Station; respectively.

Table 2. The effect of seed treatment on stands of soybeans at 17 locations in 1944

Location	Average number plants per 18 ft. row with each treatment: Check	Semesan Jr. 2 oz.	New Improved Ceresan 1/2 oz.	New Improved Ceresan 1 oz.	Arasan 1 oz.	Arasan 2 oz.	Spergon 2 oz.	Spergon 3 oz.	Mean	F. Treat.	C.V.	MSD 5%
Northern Test												
Wisconsin	163	166	166	166	162	164	160	166	164	1.1	4.10	
South Dakota	141	146	167	162	156	156	160	162	156	1.3	5.71	
Minnesota	162	168	173	178	173	172	181	180	173	3.15*	2.78	10.2
Mean	155	160	168	168	163	164	167	169		12.8**		6.6
Central Test												
Nebraska	132	141	145	144	146	141	136	143	140	0.55	10.07	
Iowa	190	193	197	182	190	192	192	188	189	4.34**	4.43	6.1
Missouri	160	157	159	177	163	151	164	167	162	2.3	3.9	
Illinois	177	179	181	180	178	177	181	183	179	0.56	2.99	
Indiana	181	185	193	192	186	192	183	192	187	2.26	5.50	
Michigan	173	177	180	183	176	183	183	182	179	1.14	6.17	
Ohio	179	177	177	180	179	184	179	173	178	1.83	3.98	
Maryland	130	128	128	117	142	152	142	135	134	5.46**	12.6	13.7
Mean[a]	166	168	171	168	171	174	169	169		2.4*		4.3
Southern Test												
Arkansas	187	194	198	199	200	198	201	203	197	1.52	3.45	
Oklahoma	123	148	147	144	152	144	145	149	144	1.42	7.62	
Mississippi	144	166	168	168	159	163	169	168	162	3.07*	6.10	13.4
Alabama	62	87	77	99	71	86	96	96	84	2.07	18.45	
Georgia	111	122	128	134	124	128	130	127	125	0.86	12.08	
North Carolina	137	148	155	146	152	149	159	168	151	2.0	8.39	
Mean[b]	125	143	143	148	142	143	148	148		3.49**		10.8

[a]Data from Missouri not included in mean because inoculation treatment not performed.

[b]Data from North Carolina not included because inoculation treatment not performed.

*Significant at 5% level.

**Significant at 1% level

Table 3. Average yields in grams per row at 16 locations in the Uniform Soybean Seed Treatment tests in 1944

Location	Yield in grams per row with each treatment								Mean	F. Treat.	F. Inoc.	C. V.
	Check	Semesan Jr. 2. oz.	New Improved Ceresan 1/2 oz.	Ceresan 1 oz.	Arasan 1 oz.	Arasan 2 oz.	Spergon 2 oz.	Spergon 3 oz.				
Northern Test												
Wisconsin	1038	1055	986	1075	1015	991	1030	994	1023	1.35	2.2	6.7
South Dakota	1072	1102	1110	1132	1092	1096	1067	1101	1096	0.48	.09	7.9
Minnesota	850	783	816	872	866	824	864	745	825	1.4	.01	10.0
Mean	986	980	970	1026	991	970	987	946	981	1.8	1.1	
Central Test												
Nebraska	735	734	764	731	768	744	720	725	740	.32	0.25	9.3
Iowa	1489	1379	1387	1394	1444	1523	1472	1420	1438	1.03	2.75	9.0
Missouri	180	182	170	166	179	182	184	172	176	1.00	0.53	14.4
Illinois	888	845	883	868	888	894	902	895	883	.54	0.24	6.9
Indiana	987	987	957	1017	1002	1006	986	1042	998	1.16	0.8	5.8
Ohio	801	730	751	719	669	836	791	775	759	2.13	0.06	11.3
Maryland	822	818	794	783	848	816	845	821	818	.52	1.0	7.9
Mean[a]	953	915	922	918	936	969	952	946	939	2.06	1.0	
Southern Test												
Arkansas	798	810	764	798	765	753	778	783	778	.36	0.00	10.8
Oklahoma	575	632	583	578	518	553	574	576	574	1.1	0.3	13.1
Mississippi	1478	1466	1375	1524	1403	1520	1368	1397	1441	1.09	0.9	11.9
Alabama[b]	198	150	---	130	206	196	154	143	168	1.8	189.0	22.3
Georgia	869	788	931	816	847	902	910	814	860	0.73	0.96	7.3
North Carolina[c]	1182	1130	1236	1211	1085	1148	1158	1258	1176	1.0	---	9.3
Mean[c]	930	924	913	929	883	932	907	892	913	0.77	0.11	

[a]Missouri yields not included in general mean because inoculation was not performed at this location.

[b]Only 3 replications and 7 treatments analyzed.

[c]Alabama and North Carolina data not included in mean because of lack of uniformity in conducting the experiment.

The plan of the experiment was the same in both years. A split plot design with 4 randomized blocks was planted at each location. The seed of one-half of each plot was inoculated with legume bacteria just before planting and the other half was left uninoculated. Transfers of a good culture of the soybean nodule organism, growing on agar, were obtained from the Soil Biology Division of the University of Illinois. The seed was treated in bulk and packaged at the U. S. Regional Soybean Laboratory and distributed, with the bacterial culture and planting plan, to all cooperators. This assured a high degree of uniformity as to seed source, chemical dosage, etc.

The seed used in the Northern section was Manchu 606 with a germination of 80%. In the Central section, the Lincoln variety was used, germination 89%, and in the South, Ogden was used with a germination of 85%. All seed was planted at the rate of 185 viable seeds per 18-foot row. The seed was planted by hand. Stand data were taked on the 18-foot row. Late in the summer, 1 foot of each end of the row was dug and the roots were examined for nodulation. Yield data were taken on the remaining 16-foot rows.

The treatments, for convenience, have been numbered as follows:

Treatment	Oz/Bu
1. Check	None
2. Semesan Jr.	2
3. New Improved Ceresan	1/2
4. New Improved Ceresan	1
5. Arasan	1
6. Arasan	2
7. Spergon	2
8. Spergon	3

Effect of Soybean Seed Treatment on Stands. Significant increases in stand from treatment with a fungicide were obtained at 4 locations: Minnesota, Iowa, Maryland, and Mississippi (Table 2). The data were subjected to the regular analysis of variance in which the check was considered as a treatment. At several additional locations all the treatments gave increased stands over the check. Under these conditions, a different method of analysis, using check versus treatments, might have been used to better advantage. The increase in stand was not so striking as in the 1943 test. Statistically significant increases were found when the data from all the locations of each of the 3 sections were summarized and analyzed. The best treatment in the Northern section was Spergon 3 oz., in Central area Arasan 2 oz., and in the South, New Improved Ceresan 1 oz. and Spergon 2 and 3 oz. The differences between the chemicals themselves are not significant in general. The poorer results obtained with seed treatment this year might be accounted for by the fact that somewhat better seed was used than in 1943.

Effect of Seed Treatment on Yield of Soybeans. The yield of soybeans was unaffected in 1944 by seed treatment. The small increase in stand was apparently not sufficient to be reflected in a yield increase. The data given in Table 3 for the tests in the 3 areas do not indicate

benefit from seed treatment.

With one exception, inoculation of the seed did not increase the yield. At Alabama, however, large increases in the yield were recorded for inoculation. At this station, the treatment x inoculation interaction was significant as the efficiency of inoculation was slightly impaired by the treatments. The mercury compounds were most harmful to the inoculant. Observations on nodule formation reported from this station indicated a considerable increase in nodulation with inoculation. At several other locations, detailed examination of the roots during favorable conditions in the growing season showed no consistent differences in nodulation. This was true on the plots planted with chemically treated seed as well as the inoculated vs. the uninoculated rows. At locations where detailed examinations were made, both the inoculated and uninoculated rows were well nodulated.

In view of the results reported here and the previous year's results (PDR Suppl. 145, pp. 76-79) on soybean seed treatments, it appears doubtful that seed treatment for soybeans can be recommended. Further tests are needed. It is known now that injury to the seeds or seedlings from the seed treatment chemicals used does not seem to occur, and that serious effects on nodulation in soils which have previously grown soybeans may not be expected. Consequently, in the event of a season causing severe weather damage to the seed, seed treatment the following year may be advisable.

SOYBEAN SEED TREATMENT SUBCOMMITTEE

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